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GEOGRAPHICAL NOTES.

BY

GEO. C. HURLBUT, *Librarian.*

CYCLONES IN AUGUST.—The Pilot Chart of the North Atlantic Ocean, for September, issued by the U. S. Hydrographic Office, shows the course of the four cyclones which traversed the ocean in the latter half of the month.

The first passed to the westward of Bermuda about 8 A.M. (Greenwich M. T.), August 16th, curved to the N. N. E., and was central at noon about 35° N. Latitude, 65° W. Longitude. At noon of August 17th it was central about 44° N. Latitude, 56° 30′ W. Longitude. Thence it continued to the N. N. E., crossed close to Cape Race and disappeared to the northward.

The second cyclone originated to the N. E. of Martinique, August 15th, passed S. of Santa Cruz on the 16th, and at noon of the 17th was central near the east end of Haiti. Through the night of the 16th–17th, it blew a hurricane at Puerto Rico. On the 18th at noon the centre was near Turk's Island, and at noon the next day about 60 miles N. E. of Cat Island. On the 20th, near N. Latitude 29°, W. Longitude 76°, the track curved to the northward and eastward and at noon, August 21st, the centre was about Latitude 37° 30′ N., Longitude

71° W. In the night of the 21st the cyclone crossed Nova Scotia, and on the 22d it passed over northern Newfoundland and thence to the N. E.

The third cyclone originated August 20th, N. E. of St. Thomas, and passed to the N. W. and then N. N. W. It reached Cape Hatteras at midnight of the 23d, and moved directly toward New York, where it was central at noon of August 24th. It did great damage on the coast.

The fourth was first reported, August 25th, N. E. of Crooked Island. It followed a northwestward course through the Bahamas and struck the American coast, in the night of August 27th, near Savannah, Georgia. This was the last intelligence received at Washington before the publication of the Chart; and it was only in the first week of September that the country learned with what fury the hurricane had swept the South Carolina coast. Towns and plantations have been destroyed; more than a thousand persons have perished, and between twenty and thirty thousand are left homeless and without means of subsistence. The Governor of South Carolina, under date of September 7th, has appealed to the people of the United States for help, and the following extract from an official report made to him by Dr. F. W. Babcock shows the urgency of the case:

COLUMBIA, S. C., September 7th, 1893.

His Excellency B. R. Tillman, Governor, Columbia, S. C.

SIR: As a result of investigations made at your request I submit the following report:

Three days were spent in making personal visits to the islands around Beaufort, and I there found the situation so serious as to demand immediate atttention.

All that portion of South Carolina known as the Sea Islands, and those parts of Colleton, Berkeley, Beaufort, and Charleston counties subjected to tidewater influences were more or less seriously damaged by the cyclone and high tide of Sun-day, August 27th. The destruction of crops and homes was more especially noticeable on the exposed islands, which include Johns, Edisto, Port Royal, Wadmalaw, Coosaw, St. Helena, and the others adjacent. The territory adjoining Combahee, Ashepoo, and the neighboring rivers was found to have suffered serious losses.

At the lowest estimate fully 1000 lives were lost. The coroner of Beaufort places the number at 800. The storm swept away at least one-half of the homes on the islands facing the ocean, such as Coosaw, St. Helena and Edisto Islands. I may state that on Land's End, Pollywana and Hope plantations the survivors are crowded into the few houses that withstood the storm. These islands are inhabited by a population of about 45,000 people, most of whom are dependent upon their crops for support.

The plantations of that section have no right to expect more than an eighth of the ordinary crop. The people are to-day living on salted potatoes they have gathered, together with corn saved. This cannot last long. There are from 20,000 to 25,000 people who will have to be supported almost wholly until another crop can be planted, about April, when they can secure advances.

DR. NANSEN'S EXPEDITION.—The London *Times* of July 24th prints this telegram dated July 21st, from Berlevaag (mispelled *Berlevang* in Stieler's Atlas) on the north coast of Norway:

> "We are leaving Vardö for Yugor Strait (between Waigatz Island, south of Nova Zembla, and the coast of Russia), where thirty sledge dogs will be waiting for us. We then proceed along the Siberian coast eastward past Cape Chelyuskin to the Olenets River, near the Lena, where another twenty-six dogs will be waiting for us. We then turn northwards, and hope to reach the west coast of the New Siberian Islands in the end of August if the ice is not bad. The latest information about the ice conditions in that quarter is favorable. We then proceed direct northwards until we get fast in the ice. If we meet with new land we shall follow along its west coast northwards. When there is no more open water we shall allow the Fram to drift with the ice. Everything has gone on well up to the present. The Fram is a splendid strong ship and will stand the ice-pressure well. She is deeply laden with coal, but that is a drawback which will soon be remedied. The accounts of the ice in the White Sea and the Barents Sea are not favorable. There has been much ice, but hope it has now improved; the ice changes quickly. I have good hopes; if we only get through the Kara Sea in good time I feel certain the prospects of success are good." FRIDTJOF NANSEN.

MR. PEARY'S EXPEDITION.—Mr. Peary's vessel, the *Falcon*, after taking in coal at St. John's, Newfoundland, on the 13th and 14th of July, steamed up the Labrador coast and reached its destination in Greenland on the 3d of August. The voyage is described in the following letter, published in the New York *Sun*, of September 6th:

"FALCON HARBOR,
"HEAD OF BOWDOIN BAY,
"GREENLAND, August 20th, 1893.

"The Falcon arrived in this harbor on the 3d of August, after a successful though disagreeable voyage, owing to the constant succession of fog and rain. After leaving Battle Harbor, Labrador, stops were made at Hopedale and Okak, Moravian mission stations in Labrador, for dogs, twenty of which were obtained. The Falcon then bore away across Davis Strait to Holsteinborg, in southwest Greenland, where she arrived on the 26th of July. Nineteen dogs and a kayak (native man's boat) were obtained here, and after a stay of some five hours the Falcon steamed northward, reaching Godhavn, on Disco Island, on the 28th. Here twenty-one dogs, another kayak, and the fur clothing ordered last spring of the Danish Government were obtained, and after a stop of fifteen hours the ship again headed northward, arriving at Upernavik two days later.

"Only a few dogs being obtainable here a stop of only three hours was made, and, with a native pilot on board, the ship steamed to Tasuisak, about forty miles further north, the most northern white settlement on the face of the globe. Here seventeen dogs were obtained, making a grand total of eighty-four.

"The stay here was only long enough to put the dogs on board and, eight hours later, the Falcon was at Duck Islands on the southern edge of Melville Bay. Five or six hours were spent here in the effort to get a supply of ducks, but the lateness of the season and the previous visit of five whalers had so diminished the ducks and made them so wild that the effort was unsuccessful.

"Leaving the Duck Islands at 4:40 P.M. on July 31st, the Falcon steamed past the point of Cape York at 5:30 P.M. on August 1st, having made the run from Duck Islands to Cape York in twenty-four hours and fifty minutes, the quickest passage on record through Melville Bay.

"The native settlement at Cape York was visited in order to make inquiries in regard to Mr. Verhoeff [the member of Peary's last expedition, who is believed to have perished in a crevasse], but no tidings could be obtained, though I found there one of the Eskimos who had been living with me at Red Cliffe House, and who was there when the Kite left for the south in August last year, and who had been with me in the search for Verhoeff.

"Steaming northward an effort was made to find natives on Saunders Island and at North Star Bay, but without success. At Netchiloome, just at the entrance to Whale Sound, two native families were found, old acquaintances who had visited Red Cliffe House. They had neither seen nor heard anything of Verhoeff. Both these families, with all their belongings and about a ton of narwhal and walrus meat for the dogs, were taken on board and brought to the site selected for the new house, a site which I noticed a year ago as being particularly suitable for our purpose.

"The location is at the head of a little rock-bound harbor, which is itself at the head of Bowdoin Bay, and is perfectly protected from wind and storm, and gives easy access to the Inland ice. After landing the material and getting the house well started, with a few members of my party on board, we steamed to the walrus ground in Whale Sound, where twenty-four were captured in one evening, and then to the eider duck and walrus haunts in the neighborhood of Littleton Island. Here, however, only five walrus and a few ducks were obtained on account of the weather. A look was taken along the ice from Cairn Point to Cape Isabella, and so far it has been undisturbed this season.

"We then visited the site of Polaris house and obtained a number of relics. We then steamed up to the bird cliffs of Hakluyt Island with the intention of obtaining birds, but a stiff southwester made this impracticable, and the ship was run into Uhlrich's Bay for reindeer. Seventeen of these were brought in in one night's hunt, and the meat and skins and the walrus were brought to the site of the house.

"All the members of the party are in the best of health and spirits, and, with the eighty-four dogs, some twenty tons of dog feed, and a dozen or more reindeer for the meat supply of the party, the prospects are extremely encouraging. It is expected that the next month's hunting will add at least fifty if not seventy-five deer to our stock, as I shall have about me in a few days six of the most trustworthy hunters of the tribe, to whom will be furnished repeating Winchesters for hunting.

"R. E. PEARY,
"Civil Engineer, U. S. N., Commanding Expedition."

Additional details are given in the following extract from a letter dated Falcon Harbour, Bowdoin Bay, Greenland, August 11, 1893, to Ex-Chief Justice Charles P. Daly, President of the American Geographical Society:

. . . "As you have doubtless learned from the press and perhaps other sources, the result of a happy suggestion that I should place my ship on exhibition at two or three of the principal cities has been to give me the funds which were still lacking to fit out my expedition properly. I feel that I have been extremely fortunate, and believe that I am justified in a certain amount of pardonable pride in that I have succeeded, in the short space of nine months, after returning from one expedition, in fitting out and starting upon a second. I have also been extremely fortunate thus far in the prosecution of my work. I landed here with eighty-four dogs, obtained at various points along the Labrador and Greenland coasts. We were scarcely troubled at all by the ice during our northern voyage. We have made the passage of Melville Bay, from the Duck Islands to Cape York, in nearly a direct line and in what I believe to be the shortest time on record—24 hours and 50 minutes. We have had the calmest weather since passing the Duck Islands, and I have here a perfect harbor for my ship and a perfect site for my house, which is to be our Arctic home. I believe that the world is in sympathy with the work, and I feel that fortune will smile upon my efforts.

"Mrs. Peary joins me in best regards to you and Mrs. Daly.

"Very sincerely,
"R. E. PEARY."

Mr. Peary expects to accomplish his purpose within a year and to return with his party in the *Falcon*, in the autumn of 1894.

An unfounded and possibly malicious despatch, sent to the public press from St. Johns, Newfoundland, on the return of the *Falcon* from Greenland, gave a discouraging account of Mr. Peary's prospects. It was said that his expedition would probably be a failure, that some of his party had openly expressed their discontent, that the burros (asses) were all dead, and that Mr. Peary would not be able to provide himself with dogs, because he was not willing to pay more than a tenth part of their value.

These absurdities, or some of them, found their way to Germany, where they received unexpected hospitality and appeared as authentic news in *Petermanns Mitteilungen* (39 Band, VIII.), under the respectable name of Dr. H. Wichmann.

WOMEN MAY NOT BE FELLOWS.—At the anniversary meeting of the Royal Geographical Society, held in May last, it was settled that the question of the admission of women to membership should be submitted to the Fellows.

Voting cards were prepared and sent by post to the 3500 Fellows. Answers were returned by 1735, as follows: 1169 voted "Yes," without qualification, and 55 "Yes," subject to qualification; 466 voted "No," and 45 "No," subject to qualification.

This vote did not decide the question. A special general meeting of the Society was held on the 3d of July, at the London University, to dispose of the matter. Speeches were made pro and con, and the Hon. G. Curzon, M.P., distinguished himself by the warmth, if not by the reasonableness, of his opposition to the proposed change.

He said that ladies were out of place in scientific societies, such as the Geographical, and that the admission of women to the Anthropological Society had quite spoilt it for scientific purposes. The change was part of the general movement to break down the natural barriers between the two sexes. The steps towards the so-called emancipation of women would be not so much injurious to men as disastrous to women. The rooms of the Society were much too small to be subjected to the overcrowding of ladies. Ladies constantly formed a large proportion of the audience at their meetings, and exercised an influence—to which he had himself succumbed—over the lecturer himself. The strongest argument, however, was the scientific character of the Society, membership of which carried great weight. Men traded on the initials, "F.R.G.S.," when they were abroad, and he earnestly hoped women would not do the like.

There must have been a great number of ladies present when Mr. Curzon made these remarks.

After further discussion the question was put, with the following result: For the resolution admitting women to ordinary Fellowship, 158; against it, 172.

DID VESPUCCI MAKE A VOYAGE IN 1506?—A passage from a despatch sent by Leonardo da Ca' Masser to the Venetian Senate from Lisbon, April 16, 1506, reads: "There are letters come from Cadiz which say that, on the 1st of March, four ships belonging to the most serene King of Castile set sail for India, towards Malacca, under the command of the Florentine, Francesco Amerigo." *

On this passage Prof. Luigi Hugues, in the *Bollettino* of the Italian Geographical Society, Serie III., Vol. vi., Fasc. v., bases an interesting argument.

He does not doubt that the Amerigo referred to is Vespucci, though the name Francesco was never borne by him. The Spanish documents, while they partly enable us to follow Vespucci for the period from 1505 to 1508, are silent with regard to him from June 5th, 1505, to the end of August, 1506, and from September, 1506, to January, 1508. It is therefore quite admissible that, between the 1st of March and the end of August, 1506, he may have performed the voyage mentioned by Leonardo Masser, for which six months would have afforded full time. It was, moreover, in the same year that Vicente Pinzon and Juan Diaz de Solis made their expedition to discover, to the westward of Cuba, the supposed strait which would open a way to Asia. There is no difficulty in admitting their return from the expedition in the interval from March 1st to August, since, in a letter to the Casa de Contratacion, under date of August 23d,† Philip the First ordered that Pinzon and Vespucci should be asked whether the ships intended for the discovery of the Spice Countries would be made ready before the winter; and the two navigators must therefore have been in Spain at that time.

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* Published in the Raccolta di Documenti e Studi pel Quarto Centenario dalla Scoperta dell' America, Parte III.—Volume 1, p. 92.

† Philip died, September 25th, 1506.

Pinzon and Solis had not succeeded in their search for the strait; and there is nothing improbable in the conjecture that it was now determined to seek the solution of the problem under more southern latitudes, and especially along the coast of Brazil, which had been explored for a considerable distance by the Portuguese expeditions of 1501 and 1503, in both of which Vespucci had taken a most active part: and, in fact, these same explorers, only two years after their Central American expedition, made a voyage along the South American coast as far as 40° South Latitude, but without discovering the mouth of the mighty Rio de la Plata.

Prof. Hugues thinks that the names of the two capes, *C. Sancti Marci* and *C. Doffin de Abril*,* in Ruysch's map of 1508, are to be referred to the voyage of 1506, and that the inscription, "*Up to this point came the ships of Ferdinand, King of Spain*,"† alludes to the same expedition.

Navarrete, after mentioning the voyage of 1506, says that the King, on his return from Naples, summoned to the Court Solis, Pinzon, La Cosa and Vespucci, in order to confer with them on the subject of further explorations towards the south and along the Brazilian coast, and this seems to show that La Cosa and Vespucci had taken part in the enterprise of 1506, possibly as captains of two of the ships.

The object of the expedition—the discovery of a passage to the East Indies—agrees, also, with Masser's statement that Amerigo intended to reach Malacca.

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* The exact form is C. De Fundabril.

† Huc usque naves Ferdinandi Regis Hispaniæ pervenerunt.

FOREIGN GEOGRAPHICAL NAMES.—Prof. Dr. E. Richter, in *Petermanns Mitteilungen*, *Bd.* 39, v., quotes in order to correct a Hungarian writer, Mr. von Déchy, who asserts that the name of the river Theiss should always be given in its true Hungarian form, *Tisza.*

Dr. Richter maintains that the river is properly called *Theiss* by the Germans, to whom Venezia is known as *Venedig*, Napoli as *Neapel*, and Milano as *Mailand*, according to the principle adopted by every European people in spelling and pronouncing foreign names of frequent occurrence. This principle, it is held, applies with peculiar force to Hungary, on ethnographical as well as on historical grounds.

The argument does not seem to cover the whole ground. London, Paris, Madrid, Marseille, Edinburgh, Le Havre, Liverpool, Porto, are some of the names which suffer no change in Germany. The *Theiss* and the *Themse* are German forms, but the Mersey and the Tweed, the Seine and the Loire, the Tajo and the Minho keep their foreign shape. The difficulties of pronunciation can have had but little to do with producing the existing modifications. Milano is as easy for a German as for an Italian tongue, and Neapel is no improvement on Napoli.

Whatever its origin may have been, a form once established is able to hold its own against the strongest proof that it ought not to be.

APIAN'S THIRD MAP OF THE WORLD (1530) AND THE

MAP OF 1551 FALSELY ASCRIBED TO HIM.*—Prof. Dr. Hermann Wagner contributes to the *Nachrichten* of the Göttingen Academy of Sciences, No. 16, for 1892, a preliminary communication on the cartography of Apianus, and especially on the two maps named in the title.

Prof. Wagner gives, from Harrisse's *The Discovery of North America, Paris*, 1892, the following list of maps ascribed to Apianus :

1. 1520, Vienna, The Tipus orbis universalis.

2. Ante 1522, to accompany the "Declaratio, etc." (lost).

[3. 1522, Small planisphere inserted in the work just mentioned.]

[4. 1524, Two diminutive maps in the "Cosmographicus liber."]

5. Circa 1524, Described in the "Isagoge" (lost).

6. 1530, Ingolstadt. From his own private press.

7. 1530, Antwerp. Printed by Peter de Vales de Guldenhant.

[8. A MS. mappa mundi made for Charles V., formerly preserved in the Escurial (lost).]

Though Prof. Wagner hopes that traces may yet be found of the lost map of 1522, and perhaps, also, of other maps of Apian's, he recognizes only three maps of the world as genuine works of that cosmographer These are :

Typus orbis universalis, of 1520, Vienna.

Mappa mundi, of 1522, Vienna or Ratisbon ?

Tabula orbis cogniti universalior, of 1530, Ingolstadt.

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* Die dritte Weltkarte Peter Apians v. J. 1530 und die Pseudo-Apianische Weltkarte von 1551, Vorläufige Mitteilung von Hermann Wagner.

The *Charta Cosmographica*, of 1544 (1551), must be rejected as not genuine. It is to be assigned to Gemma Frisius. The small maps of the *Declaratio* and the *Cosmographicus liber* do not call for further notice, and nothing is known with regard to the MS. map said to have been drawn by Apianus for Charles V. The passage in Cl. Clemens, to which Harrisse refers, speaks as plainly as possible of an *instrument*, and not of a map:

"There is one (instrument), presented by its maker, Peter Apianus, to the Emperor Charles V., convenient for ascertaining the sites, elevations, distances and extent of places; and to explain its use he wrote four great books, some of which have been published, and some, still in MS., are kept here with the instrument itself." *

The *Typus orbis universalis* owes its preservation to the fact that it was published in two works, the Camers edition of Solinus, 1520, and the Vadianus Pomponius Mela, 1522.

The *Mappa Mundi* of 1522 is lost. Prof. Wagner thinks it may yet be found, bearing the name of its maker, "for Apianus did not hide his light under a bushel, but marked his productions with his name and title and origin." There exists but one anonymous writing of his: the *Cosmographiae Introductio.*

The Universalior cogniti orbis Tabula of 1530 is now in the map room of the British Museum. Prof.

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* Est unum (sc. instrumentum) a P. Ap. ejus auctore oblatum Carolo V. Imp., locorum sitibus, altitudinibus, distantiis et amplitudinibus explorandis commodum; ejus usui cognoscendo quatuor grandes tomos scripsit, quorum alii editi sunt in lucem, alii MSti (sc. tomi !) cum eodem instrumento hic asservantur.

Wagner gives a somewhat detailed description of this, which he calls the "third and best map of the world by Apianus," and promises to issue a copy of it with his more elaborate paper. It is on the cordiform projection. Twelve pages are devoted to an examination of the *Pseudo-Apianische Weltkarte* of 1551. The results arrived at are :

1. That Peter Apianus is in no sense the author of the *Charta Cosmographica.*
2. That this is to be assigned, not to the year 1551, but to 1544.
3. That a series of facts brings it into such close relation with Gemma Frisius that the map may be declared to be his work.

THE INLAND ICE OF EASTERN GREENLAND.—Mr. Hansen-Blangsted reports, in the *Revue de Géographie* for September, p. 230, that Lieut. Garde, of the Danish navy, has just completed an exploration of the Inland ice from the eastern side. The starting-point was the glacier of Sermilsialik in 61° N. Lat.

The distance travelled was 300 kilometres (186 miles) and the time occupied thirteen days.

The journeys were made by night, which was found to be a better time for marching over the ice.

The highest elevation was 7,000 feet, and Lieut. Garde's experience, like Mr. Peary's, showed that the glaciers along the coast offered greater difficulties than those of the interior.

Mr. Hansen-Blangsted gives expression to the patriotic hope that the Danish explorers of Greenland will not allow themselves to be anticipated by men of other nations.

JACKSON'S POLAR EXPLORATION.—Mr. F. G. Jackson left England in July for Novaia Zemlia, where he means to pass the coming winter in order to familiarize himself with arctic life and to practise the management of the sledges which he has constructed. It is his purpose to make his start for the Pole in the spring, by way of Franz Josef Land.

THE BAR OF CHARLESTON HARBOUR.—*The News and Courier*, of September 11, reviews the work done during the past year in deepening the channel across the bar at Charleston, South Carolina.

Two stone jetties have been raised to a height of from 8 to 12 feet above low water. The material used was: for the north jetty, 187,994 tons and 112,335 cubic yards of stone and 175,155 square yards of mattress; for the south jetty, 217,586 tons and 143,414 cubic yards of stone and 306,585 square yards of mattress. The dredging has amounted to 616,192 cubic yards. The results achieved are: a good 15-foot channel between the jetties all the way through at mean low tide (the tide rises six feet at Charleston) from deep water outside to deep water inside, perfectly straight and of sufficient width to be safely navigated. For a great part of the way a much greater depth has been obtained. Except for a stretch of about 2000 feet outside of the large red buoy and of another stretch of about 800 feet at the extreme outer end there are now 18 feet at mean low tide. For a distance of about one-half a mile, just where old Swash Reef used to be, with least depth of from 7 to 8 feet, there are now 21 feet or more at low water.

The jetties are capable not only of maintaining the dredged channel, but of producing enormous scour without the aid of a dredge. Over 1,000,000 cubic yards of sand have disappeared from the area between the jetties and between their axes prolonged, since 1884, of which 500,000 have passed out in the last twelve months.

The Light House Board has lighted the new channel by placing a brilliant back range high up in St. Philip's steeple, and now vessels can enter at night as well as by day by bringing Sumter light in range with St. Philip's light.

THE DISMAL SWAMP.—The Tenth Annual Report of the U. S. Geological Survey contains a paper by Prof. N. S. Shaler on the Fresh-Water Morasses of the United States, with a Description of the Dismal Swamp District of Virginia and North Carolina.

Inundated lands are divided according to their physical character into marine marshes and fresh-water swamps. The marshes are subdivided into those above mean tide—grass marshes and mangrove marshes—and those below mean tide—mud banks and eel-grass areas.

There are four subdivisions of fresh-water swamps: river swamps, divided into terrace and estuarine; lake swamps, divided into lake margins and quaking bogs; upland swamps, divided into wet woods and climbing bogs; and ablation swamps.

Prof. Shaler estimates the total area of reclaimable inundated lands in the territory of the United States, east of the Rocky Mountains, at between 105,210 and 131,200 square miles. Florida has about 30,000 square miles, or half the area of the State; Louisiana comes next with about 15,000, the area of the State being 48,720 square miles; Mississippi and Arkansas have each about 10,000; and Michigan, the next in order, has between 6000 and 9000 square miles. These are approximate figures, based on the study of the existing maps. For the region between the Rocky Mountains and the Pacific, Prof. Shaler is disposed to think that the total area of soil which may be won from inundation by ordinary engineering devices does not exceed 10,000 square miles.

The Dismal Swamp covers about 1500 square miles in Eastern Virginia and North Carolina. Originally it was perhaps one-third greater than its present size. The Dismal Swamp canal, constructed in the last century, runs at right angles to the slope of the country and interferes with the natural drainage, the dike on the west retaining the waters in that region, so that the western section of the swamp is probably wetter than it was before the construction of the barrier, and the eastern section has become partially desiccated. Many places east of the canal might be tilled in an ordinary summer season without inconvenience from water.

About the centre of the western section is Lake Drummond, a shallow body of water, 18 or 20 miles in circumference. The local tradition is that the basin of this lake was formed by forest fires. Prof. Shaler regards it, on the contrary, as one of the peat-enclosed lakes, so common in the small morasses of the glaciated era.

The vegetation of the Dismal Swamp exhibits considerable diversity. The higher land, lying not more than three feet above the lowest adjacent levels, is occupied by a growth of the common Southern pines. The trees in the lower levels are of three species, all tolerant of water about their roots: the Taxodium or bald cypress, the juniper and the black gum (Nyssa uniflora). The juniper grows on ground which is somewhat desiccated during the dry season; the gum and the cypress can inhabit areas which are water-covered even during the growing season; and it appears that the knees of the cypress develop only where the roots upon which they rest lie beneath the surface of the water at this time. The tallest knees seen in the Dismal Swamp are elevated not more than three feet above the roots, while those of the Mississippi Valley swamps attain twice that height.

The western border of the swamp is well-defined by a sharp elevation or escarpment, clearly an ancient sea-margin, traceable from a point north of Suffolk to the southern border of the morass. with a general trend north and south. The average difference of height between the base and the summit plain is about 20 feet; and, although its surface is more or less eroded by stream action, it is on the whole better and more continuously manifested than in any other marine bench which Prof. Shaler has seen in this country or in Europe.

The animal life of the Dismal Swamp is not of many kinds. The birds that build on the ground are generally absent, and the rodents are unknown. Bears are numerous, and two hundred are killed every year. Deer have become scarce, but there are many wild cattle, described as generally black and of small size, but fierce and dangerous to the hunter. They feed on the tender shoots of the cane, and range in herds of from twenty to fifty. Individuals are sometimes led by offerings of salt to join the domestic herds, but it is evident that the wild cattle live entirely without salt, since the tidal rivers which penetrate to the swamp are all fresh and there are neither springs nor licks like those to which the buffalo resorted in the Mississippi Valley.

The whole of the Dismal Swamp area, with the exception of small strips near the mouths of the inlets from Albemarle Sound, may, in Prof. Shaler's opinion, be won to tillage. All the important parts of the swamp system lie well above tide-water, and the average inclination of the surface is about twenty inches per mile. The value of the land, if reclaimed and cultivated, is estimated at a very high but not unreasonable figure, considering the known fertility of the soil and the ease of access to great markets.

The district cannot be called unhealthy. A certain amount of malarial fever occurs around the margins, where the summer heat dries out a portion of the swamp area; but the central portions of the morasses at the distance of a mile from the margin seem to be fairly exempt, and the people in the interior of the swamp are less affected by fevers than those who live on the ordinary upland surface of Virginia and North Carolina.

THE LAKE MISTASSINI REGION.—Early in September the Department of Crown Lands for the Province of Quebec sent out a party to begin a thorough survey of the country north of Lake St. John. Work will be prosecuted for about three months and then discontinued until the spring of 1894, when it will be resumed and carried on till late in the autumn. The plan is to complete the survey in three years, and to acquire definite knowledge, once for all, of a practically unexplored district.

THE SWISS LAKES.—*Petermanns Mitteilungen, Bd.* 39, *No.* v, prints a table by Prof. J. J. Egli, giving the area and the depth of forty-two Swiss lakes. The areas are in square kilometres, the depths in metres.

	AREA		DEPTH	
	Sq. Km.	Sq. M.	Metres	Feet
Aegeri	7	2.70	83	272
Baldegg	5.04	1.97	66	217
Bienne	42.16	16.28	78	256
Brienz	29.95	11.56	261	856
Constance*	539.14	208.17	255	837
Geneva	577.84	223.11	310	1017
Greifen	8.44	3.26	34	112
Hallwyl	10.37	4.00	48	157
Joux	9.30	3.59	34	112
Lowerz	2.84	1.10	13	43
Lucerne	113.36	43.77	214	702
Lugano	50.46	19.49	288	945
Maggiore†	214.27	82.73	365	1198
Morat	27.42	10.59	49	161
Neuchâtel	239.62	92.52	153	502
Pfäffikon	3.10	1.19	36	118

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* Including the Unter See.

† Prof. Egli admits a possible greater depth south of Luino, at which point the Swiss soundings cease.

	AREA		DEPTH	
	Sq. Km.	Sq. M.	Metres	Feet
Poschiavo	1.60	.62	84	276
St. Moriz	3.15	1.22	44	144
Sarnen	7.40	2.86	52	171
Sempach	14.28	5.52	87	285
Sils	4.00	1.54	71	233
Silva Plana	2.86	1.11	77	253
Thun	47.92	18.50	217	712
Walen	23.27	8.99	151	495
Zug	38.48	14.86	198	650
Zurich*	87.78	33.90	143	469

Sixteen of the forty-two lakes have areas of less than half a square mile. These are:

	AREA Sq. Km.	DEPTH Metres
Bianco	.82	47
des Brenets	.57	32
Burgäschi	.23	31
Campfer	.54	34
Davos	.55	54
Klön	1.18	33
Lungern	.86	33
Märjelen	.41	47
Mauen	.57	9
Moosseedorf	.31	22
Nero	.08	12
Oeschinen	1.14	63
Seelisberg	.18	37
Soppen	.24	28
de Taney	.17	31
Türl	.49	22

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* Including the Obersee.

In the last edition of the *Encyclopædia Brit.*, Vol. XXII., p. 777, Hallwyl is credited, doubtfully, with a depth of 1522.8 feet, and the approximate depth of the Lake of Zug is put at 1321 feet.

THE CORINTH CANAL.—The opening of the canal across the Isthmus of Corinth took place on the 6th of August, in the presence of the royal family, the ministers and the diplomatic body. The king, in his discourse, gave the credit of the enterprise to the minister Zaïmis, who conceived it, and General Türr, who directed it from the beginning to the end.

The queen then cut, with a pair of gilded scissors, the white silk ribbons, which had been stretched across the canal, and the *Sphakteria* (surely, a name of ill omen !), with the royal family on board, passed in, followed by a torpedo flotilla, a Russian war-ship, four English ships, and a great number of steamers and other vessels.

The canal is just 4 miles long, 26 feet deep and 72 feet in width, and it is cut through almost solid rock, rising at the highest point to 200 feet above the sea. At the western entrance stands the town of Poseidonia and at the eastern Isthmia, near the place made famous by the celebration of the Isthmian games.

THE DEATH OF EMIN PASHA.—The following account appeared in the London *Times* of September 5th : "All doubt concerning the death of Emin Pasha now seems to be removed by the circumstantial account of his murder given to Mr. A. J. Swann. This gentleman, who for ten years, has been working on the London

Missionary Society's staff on Lake Tanganyika in Ujiji, has just reached London, accompanied by his wife, the only European lady who has ever visited that country. Speaking of Emin Pasha's death to a representative of Reuter's Agency, Mr. Swann said :—"

"As to the death of Emin there is no question; in the interior it is accepted as a fact, but some uncertainty prevails on the subject at the coast. Personally I am as certain that Emin is a dead man as I am that I am sitting here. The report of his death came to me at Ujiji in consequence of a letter which had been received there asking what should be done with Emin's effects. I at once made inquiries, and was told that he had been killed in the Manyema country by Seyd Bin Abed, and that his following of thirty Nubian soldiers had been killed and eaten. This report, which was of a most circumstantial character, reached me from four different sources in Ujiji, and to my mind is as conclusive as anything can be in Africa. It is implicitly believed by all the Arabs, who seem very well pleased to have at last got rid of Emin.

"One of my informants was an Arab who had been travelling on Emin's route. This Arab not only described Emin's journey, but, although he had probably never seen a map in his life, sketched on a piece of paper the various places touched by the explorer, and described how he had been tracked by the Arabs, who had made up their minds to kill him. Emin passed through Ruanda country and had followed one of the rivers flowing into the Congo until he came to Seyd Bin Abed's residence, where he stopped. Shortly after his arrival a number of Arabs went out and asked Emin where he was going. Emin replied, 'I am going to the coast.' Another Arab then went forward and said, 'You are Emin Pasha, who killed the Arabs at the Victoria Nyanza. I will kill you.' He then took a large curved Arab knife from his belt and, brandishing it aloft, struck off Emin's head. His body was then thrown to the Manyema, who devoured it, the Nubian followers being afterwards also killed and eaten.

"In estimating the credibility of this report," said Mr. Swann, "it must be remembered that Ujiji is the nearest spot to that where Emin had last been heard of. So much impressed was I with the account that I ordered Rumaliza to get any papers or letters left by Emin, and he promised to do so. The greatest uncertainty is felt on the subject at the coast, but the fact that Emin has never been seen or heard of since he reached Ruanda speaks volumes."

In a letter to the *Times* of September 6th, Mr. Swann corrects one error, and is made the victim of another. He did not say that Mrs. Swann was the only European lady who had ever entered Ujiji, but that she was the only one who had travelled overland from Zanzibar to

Ujiji and thence across the plateau to Lake Nyassa and the *Zanzibar* River. Mr. Swann undoubtedly wrote *Zambezi*, but the *Times* has its own geography.

RUINED TEMPLES IN MASHONALAND.—Mr. R. M. W. Swan writes to the *Geographical Journal* for September, 1893, p. 263:

> "I have examined two ruined temples of the Zimbabwe period and style, situated at the confluence of the Lotsani and Limpopo Rivers in S. Latitude 22° 39′ 42″, E. Longitude 28° 16′ 30″. The temples show the same system of orientation and geometrical construction as the great temple at Zimbabwe. I cleared the bush from the more perfect of the two temples on the Lotsani, and made a careful measurement of many of the radii of the one curve of which it consists. I oriented directly from the centre of the curve and saw the sun from that point setting just to the left of the middle of the main doorway. On correcting the position of the sun for its decrease in declination during the seventeen days which had elapsed since the solstice, I found that it would set at the solstice exactly in a line with the centre of the arc and the middle of the doorway. This direct measurement and observation should remove any doubt as to the applicability of our theory of the construction of the plans of these temples."

GEOGRAPHY AT THE MEETING OF THE BRITISH ASSOCIATION.—The British Association for the Advancement of Science met at Nottingham, September 13. Sir Archibald Geikie, the retiring President, formally introduced his successor, Dr. Burdon Sanderson, whose address was on the subject of Biology, the origin and first use of the term, and the relations between that and other branches of natural science.

The London *Times* reports at length the address of Mr. Henry Seebohm, Sec. R.G.S., F.L.S.,F.Z.S., who presided over the Section of Geography.

He chose for his subject the Polar Basin, of which he said that "the relative distribution of land and water and the geographical distribution of light and heat in the Arctic region is absolutely unique. In no other part of the world is a similar climate to be found."

He estimated the unexplored regions of the Basin at 1,000,000 square miles and briefly reviewed the work of exploration already accomplished by Peary and Nansen, and gave a sketch of the enterprises in which they are now engaged. Nansen hopes that the current which carried the Jeannette from Herald Island, north of Behring Strait, in a north-westerly direction for 500 or 600 miles is the same current that flows down the east coast of Greenland, and he bases his hopes upon three facts. First, that many articles from the wreck of the Jeannette were found on an ice floe off the South coast of Greenland three years afterwards; secondly, that a harpoon-thrower of a pattern unknown except in Alaska was picked up on the south-west coast of Greenland; and thirdly, that drift-wood supposed to be of Siberian origin is stranded regularly in considerable quantity on the coasts of Greenland. The Norwegian at Hammerfest, about latitude 70 deg., is dependent for his firewood upon the Gulf Stream, which brings him an ample supply from the Gulf of Mexico, whilst the Eskimo, on the Greenland coast, in the same latitude, trusts to a current from the opposite direction to bring him his necessary store of wood from the Siberian forests.

By no means the least important physical feature of the Polar Basin is its gigantic river systems. The rivers which flow into the Arctic Ocean are some of them amongst the greatest in the world. Some idea of the relative sizes of the drainage areas of a few of the best known rivers may be learnt from the following, in which the Thames, with a drainage area of 6,000 square miles, is the unit:—9 Thames equal 1 Elbe (54,000); 2 Elbes equal 1 Pechora (108,000); 2½ Pechoras equal 1 Danube (270,000); 2 Danubes equal 1 Mackenzie (540,000); 2 Mackenzies equal 1 Yenisei (1,080,000); 2 Yeniseis equal 1 Amazon (2,160,000). There is nothing that makes a greater impression upon the Arctic traveller than the enormous width of the rivers. The Pechora is only a river of the fifth magnitude, but it is more than a mile wide for several hundred miles of its course. The Yenisei is more than three miles wide for at least a thousand miles and a mile wide for nearly another thousand. Whymper describes the Yukon as varying from one to four miles in width for three or four hundred miles of its length. The Mackenzie is described as averaging a mile in width for more than a thousand miles, with occasional expansions for long distances to twice that size. If we assume that the unknown regions are principally sea, then the Polar Basin, including the area drained by all rivers flowing into the Arctic Sea, may be roughly estimated to contain about 14,000,000 square miles, of which half is land and half water. In the coldest part of the basin the land is either glacier or tundra, and in the warmer parts it is either forest or steppe. Greenland, the home of the glacier and the mother of the icebergs of the Northern Atlantic, rises 9,000 or 10,000 feet above sea level, whilst the sea between that lofty plateau and Scandinavia is the deepest known in the Polar Basin, though it is separated from the rest of the Atlantic by a broad belt or submarine plateau connecting Greenland across Iceland and the Faroes with the British Islands and Europe. Iceland, Spitzbergen, and

Novaya-Zemlia, the latter a continuation of the Urals, are all mountainous and full of glaciers. The glaciers of Southern Alaska are some of the largest in the world.

The Arctic Sea, which lies at the bottom of the Polar Basin, is fringed with a belt of bare country, sometimes steep and rocky, abruptly descending in more or less abrupt cliffs and piles of precipices to the sea, but more often sloping gently down in mud banks and sand hills representing the accumulated spoils of countless ages of annual floods, which tear up the banks of the rivers and deposit shoals of detritus at their mouths, compelling them to make deltas in their efforts to force a passage to the sea. In Norway this belt of bare country is called the Fjeld, in Russia it is known as the Tundra, and in America its technical name is the Barren Grounds. In the language of science it is the country beyond the limit of forest growth. In exposed situations, especially in the higher latitudes, the tundra does really merit its American name of Barren Ground, being little less than gravel beds interspersed with bare patches of peat or clay, and with scarcely a rush or a sedge to break the monotony. In Siberia at least this is very exceptional. By far the greater part of the tundra, both east and west of the Ural Mountains, is a gently undulating plain, full of lakes, rivers, swamps, and bogs. The lakes are diversified with patches of green water plants, amongst which ducks and swans float and dive ; the little rivers flow between banks of rush and sedge ; the swamps are masses of tall rushes and sedges of various species, where phalaropes and ruffs breed, and the bogs are brilliant with the white fluffy seeds of the cotton grass. The groundwork of all this variegated scenery is more beautiful and varied still—lichens and moss of almost every conceivable colour, from the cream-coloured reindeer moss to the scarlet-cupped trumpet moss, interspersed with a brilliant alpine flora, gentians, anemones, saxifrages, and hundreds of plants, each a picture in itself, the tall aconites, both the blue and yellow species, the beautiful cloudberry, with its gay white blossom and amber fruit, the fragrant *Ledum palustre* and the delicate pink *Andromeda polifolia*. In the sheltered valleys and deep watercourses a few stunted birches, and sometimes large patches of willow scrub, survive the long severe winter, and serve as cover for willow grouse or ptarmigan. The Lapland bunting and red-throated pipit are everywhere to be seen, and certain favoured places are the breeding grounds of snipe, plover, and sandpipers of many species. So far from meriting the name of barren ground, the tundra is for the most part a veritable paradise in summer. But it has one almost fatal drawback, it swarms with millions of mosquitoes. The tundra melts away insensibly into the forest, but isolated trees are rare, and in Siberia there is an absence of young wood on the confines of the tundra. The limit of forest growth appears to be retiring southward, if we may judge from the number of dead and dying stumps ; but this may be a temporary or local variation caused by exceptionally severe winters. There are no trees on Novaya-Zemlia. Two or three species of willow grow there, but they are dwarfs, seldom attaining a height of 3 in. Novaya-Zemlia enjoys a comparatively mild winter, the mean temperature of January, thanks to the influence of the Gulf Stream, being 15 deg. Fahr. above zero in the south, and only 5 deg. Fahr. below zero in the north. The absence of trees is due to the cold summers, the mean temperature of July not reaching higher than 45 deg. Fahr. in the south, whilst in the north it only reaches 38 deg. Fahr. After some observations on the steppe regions and on the anthropology of the Polar Basin, Mr. Seebohm expressed his opinion that life areas, or zoo-geographical regions, are more or less fanciful generalizations. Animals recognize facts, and are governed by them in the extension of their ranges; they care little or nothing about generalizations. The mean temperature of a province is a matter of indifference to some plants and to most animals. The facts which govern their distribution are various, and vary according to the needs of the plant or animal concerned. To a migratory bird the mean annual temperature is a matter of supreme indifference. To a resident bird the question is equally beside the mark. It is very important, however, to remember that it is actual temperature that governs them, not isotherms corrected to sea level.

After remarking on the eccentricity of isothermal lines in the Polar Basin, the President described the intimate relations which subsist between geography and geology. A knowledge of geography, he said, is absolutely essential to the geologist. To discriminate between one kind of rock and another is a comparatively small part of the work of the geologist. To ascertain the geographical distribution of the various rocks is a study of profound interest. If the geologist owes much to the geographer the latter is also largely indebted to the labours of the former. The geology of a mountain range or an extended plain is as important to the physical geographer as the knowledge of anatomy is to the figure painter. The geology of the Polar Basin is not very accurately known, and the subject is one too vast to be more than mentioned on an occasion like the present; but the evidences of a comparatively recent ice age in Eastern America and Western Europe are too important to be passed over without a word. In the sub-Arctic regions of the world there is much evidence to show that the climate has in comparatively recent times been Arctic. The present glaciers of Central Europe were once much greater than they are now, and even in the British Islands glaciers existed during what has been called the ice age, and the evidence of their existence in the form of rocks, upon which they have left their scratches and heaps of stones, which they have deposited in their retreat, are so obvious that he who runs may read. Similar evidence of an ice age is found in North America, and to a limited extent in the Himalayas, but in the alluvial plains of Siberia and North Alaska, as might be expected, no trace of an ice age can be found. The extreme views of the early advocates of the theory of an ice age have been to a large extent abandoned. No one now believes in the former existence of a Polar ice cap, and possibly when the irresistible force of ice-dammed rivers has been fully realized, the estimated area of glaciation may be considerably reduced. The so-called great ice age may have been a great snow age with local centres of glaciation on the higher grounds.

Mr. Seebohm then gave a graphic description, largely drawn from personal experience, of the succession of the seasons in these high latitudes. He said the stealthy approach of winter on the confines of the Polar Basin is in strong contrast to the catastrophe which accompanies the sudden onrush of summer. One by one the flowers fade and go to seed, if they have been fortunate enough to attract by their brilliancy a bee or other suitable pollen-bearing visitor. The birds gradually collect into flocks, and prepare to wing their way to southern climes. Strange to say it is the young birds of each species that set the example. They are not many weeks old. They have no personal experience of migration, but Nature has endowed them with an inherited impulse to leave the land of their birth before their parents. Probably they inherit the impulse to migrate without inheriting any knowledge of where their winter quarters are to be found, and by what route they are to be sought. The date upon which winter resumes his sway varies greatly in different localities, and probably the margin between an early and a late season is considerable. In 1876 Captain Wiggins was frozen up in winter quarters on the Yenisei in latitue 66½° on October 17th. In 1878 Captain Palander was frozen up on the coast 120 miles west of Behring Strait, in latitude 67¾°, on September 28th. The arrival of summer in the Arctic regions happens so late that the inexperienced traveller may be excused for sometimes doubting whether it really is coming at all. When continuous night has become continuous day without any perceptible approach to spring an Alpine traveller naturally asks whether he has not reached the limit of perpetual snow. It is true that here and there a few bare patches are to be found on the steepest slopes, where most of the snow had been blown away by the wind, especially if these slopes face the south, where even an Arctic sun has more potency than it has elsewhere. It is also true that small flocks of little birds—at first snow-buntings and mealy redpolls, and later shore larks and Lapland buntings—may be observed to flit from one of these bare places to another, looking for seeds or some other kind of food, but after all evidently finding most of it in the droppings of the peasants' horses on the hard snow-covered roads. The appearance of these little birds does not, however, give the same confidence in the eventual coming of summer to the Arctic naturalist as the arrival of the swallow or the cuckoo does to his brethren in sub-Arctic and sub-tropic climates. The four little birds just mentioned are only gipsy migrants that are perpetually flitting to and fro on the confines of the frost, continually being driven south by snow-storms, but ever ready to take advantage of the slightest thaw to press northwards again to their favorite Arctic home. They are all circumpolar in their distributions, are as common in Siberia as in Lapland, and range across Canada to Alaska as well as to Greenland. In sub-Arctic climates we only see them in winter, so that their appearance does not in the least degree suggest the arrival of summer to the traveller from the south. The gradual rise in the level of the river inspires no more confidence in the final melting away of the snow and the disruption of the ice which supports it. In Siberia the rivers are so enormous that a rise of five feet or six feet is scarcely perceptible. The Yenisei is three miles wide at the Arctic Circle, and as fast as it rises the open water at the margin freezes up again, and is soon covered with the drifting snow. During the summer which I spent in the valley of the Yenisei we had six feet of snow on the ground until the 1st of June. To all intents and purposes it was mid-winter, illuminated for the nonce with what amounted to continuous daylight. The light was a little duller at midnight, but not so much so as during the occasional snowstorms that swept through the forest and drifted up the broad river bed. During the month of May there were a few signs of the possibility of some mitigation of the rigours of winter. Now and then there was a little rain, but it was always followed by frost. If it thawed one day it froze the next, and little or no impression was made on the snow. The most tangible sign of coming summer was an increase in the number of birds, but they were nearly all forest birds, which could enjoy the sunshine in the pines and birches, and which were by no means dependent on the melting away of the snow for their supply of food. Between May 16th and 30th we had more definite evidence of our being within bird flight of bare grass or open water. Migratory flocks of wild geese passed over our winter quarters, but if they were flying north one day they were flying south the next, proving beyond all doubt that their migration was premature. The geese evidently agreed with us that it ought to be summer, but it was as clear to the geese as to us that it really was winter. We afterwards learnt that during the last ten days of May a tremendous battle had been raging 600 miles as the crow flies to the southward of our position on the Arctic Circle. Summer in league with the sun had been fighting winter and the north wind all along the line, and had been as hopelessly beaten everywhere as we were witnesses that it had been in our part of the river. At length, when the final victory of summer looked the most hopeless, a change was made in the command of the forces. Summer entered into an alliance with the south wind. The sun retired in dudgeon to his tent behind the clouds, mists obscured the landscape, a soft south wind played gently on the snow, which melted under its all-powerful influence like butter upon hot toast, the tide of battle was suddenly turned, the armies of winter soon vanished into thin water and beat a hasty retreat towards the Pole. The effect on the great river was magical. Its thick armour of ice cracked with a loud noise like the rattling of thunder, every twenty-four hours it was lifted up a fathom above its former level, broken up, first into ice floes and then into pack ice, and marched down stream at least a hundred miles. Even at this great speed it was more than a fortnight before the last straggling ice-blocks passed our post of observation on the Arctic Circle, but during that time the river had risen seventy feet above its winter level, although it was three miles wide, and we were in the middle of a blazing hot summer, picking flowers of a hundred different kinds, and feasting upon wild ducks' eggs of various species. Birds abounded to an incredible extent. Between May 29th and June 18th I identified sixty-four species which I had not seen before the break-up of the ice. Some of them stopped to breed and already had eggs, but many of them followed the retreating ice to the tundra, and we saw them no more until, many weeks afterwards, we had sailed down the river beyond the limit of forest growth. The victory of the south wind was absolute, but not entirely uninterrupted. Occasionally the winter made a desperate stand against the sudden onrush of summer. The north wind rallied its beaten forces for days together, the clouds and the rain were driven back, and the half-melted snow frozen on the surface. But it was too late; there were many large patches of dark ground which rapidly absorbed the sun's heat; the snow melted under the frozen crust, and its final collapse was as rapid as it was complete.

It is not always easy to interest an audience in the

Polar Basin, and Mr. Seebohm's address fully deserved the vote of thanks with which it was received. The phenomena which mark the coming and the triumph of the Northern summer are well described, but Mr. Seebohm's battlepiece is only an amplification of Thomson's, and, with all its effectiveness, the Hudibrastic simile of the buttered toast owes its inspiration perhaps too directly to the famous couplet:

And, like a lobster boiled, the morn
From black to red began to turn.

Papers were read—by Mr. Guy Boothby, describing his journey across Australia from north to south; by Mrs. Lilly Grove, F.R.G.S., on her visit to Chiloe and the neighboring islands; and by Mr. Herbert Ward, on Environment in Relation to the Native Tribes of the Congo Basin.

At a combined meeting of Sections C. and E. to discuss the limits between Geology and Geography, the first paper was read by Mr. Clements R. Markham, F.R.S., who, in considering the boundary-line between geology and physical geography, approached the subject as a geographer. From a central geographical position the limits of their science might be defined, distinguishing between the subjects which were within their boundary and those which, although clearly belonging to another division of knowledge, were still pertinent to their inquiries. The first work of geographers was to measure all parts of the earth and sea and to fix the relative positions of all places on the earth's surface. They first established the locality, and then studied the phenomena within a given area and the changes which had taken place during historical times—the changes respecting which there was human testimony in some shape or form, not necessarily written testimony. These changes generally explained to us the laws according to which similar changes were now taking place around us. This was physical geography. From the point of view of its connexion with physical geography he took geology to be a study of the condition of the earth and of the changes that had taken place on its surface during the cycles of ages previous to the dawn of history. Sir Roderick Murchison used to say that the geologist was the physical geographer of former periods. When he studied the phenomena of physical geography it was to collect *data* which would enable him to solve some problem of remote ages. The geologist and the geographer used the same materials, but for different purposes—the former to find interpretations of problems relating to the past, the latter to explain what was actually taking place in the present. The physical geographer certainly had to learn from geology the influence that the nature of the various rocks and their present positions had had, and still had, on the features of the earth's surface as we now saw them. For instance, the causes which decided the direction of river-beds could generally be ascertained by a study of the nature of the rocks and of their inclinations round the fountains and along the river courses. But the objects of such study were different from those of the geologist; and no geological facts or arguments came within the sphere of the geographer's work unless they helped to explain an existing geographical feature. The aid derived by the closely allied sciences from each other did not interfere with the enunciation of a distinct limit between them. He believed this boundary-line was to be found where human testimony ceased. Geography fixed localities. It found certain physical phenomena peculiar to each locality, and it sought for their causes. In such research the two sciences of geology and geography were on common ground ; but while the object of the former was to obtain explanations of phenomena in the remote past, that of the latter was to seek reasons, from the testimony of history, for the condition of the locality as the geographer saw it before him. In order to test the application of a canon intended to define the boundary line of the two sciences, it would be well to select some given area for the purpose. The great valleys of the Ganges and the Indus would be suitable. If we went back to the earliest human records, we should find that the inhabitable part was confined to the water-parting between the Jumna and the Sutlej. All the rest of the present valley of the Ganges was an arm of the sea. The vast region between Delhi and Calcutta had become habitable within the historical period. As dynasty succeeded dynasty, we found the foundation of cities recorded in situations lower and lower down the valley. The physical geographer compared the records of history with what he could now see with his own eyes. The process that was going on was described by Mr. H. F. Blanford. Standing on the banks of the Ganges, and watching the turbid flood swirling past, the observer saw the *chur* opposite, which the river left dry when its waters fell at the close of the last rainy season. Until lately it was covered by a rich green crop of indigo. It was now more than half cut away and buried beneath the waters. Huge masses detached themselves from time to time and were swallowed up by the deep, muddy stream. These were present facts. The inquirer then learnt that half a century ago the river itself was only a moderate-sized *khall*, and that an old channel, seven or eight miles off, and now little more than a string of pools, was at that time a great river. Turning to history, he would find that the ancient records of the people gradually unfolded the causes and effects of what he had seen and heard. The positions of the capitals of the different dynasties which successively reigned in the valley plainly continued the story, until the Vedas were reached. Then the whole wonderful record was unfolded through the help of human testimony. If we came nearer home we saw how the remarkable phenomena connected with the long battle between the land and the sea at the delta of the Rhine taught another memorable lesson in physical geography, with the aid of history. We saw what was going on now ; the dunes protecting Holland from destruction, the Zuyder Zee, the numerous islands, and the tracts of reclaimed land. Human testimony explained the causes which produced the present condition of this region, and the gradual changes in the course of centuries. The slow movement of the dunes was revealed to us by the statue and temple of Nehelennia, which was uncovered some years ago on the Domburg Sands. A drive of 12 miles northward from Bruges conducted the inquirer to the little country town of Sluys, which was surrounded as far as the eye could reach with cornfields and meadows, and clumps of tall trees. The student of Froissart read how our King Edward III. gained a great naval victory over the French fleet on this very spot. If he continued his researches and studied the histories of the great struggle between the United Provinces and Philip II. of Spain, he would find that a change had slowly but surely been taking place. Sluys was still a port, but with very different surroundings from the Sluys of the 14th century. From that time he might trace its story, with the aid of a succession of maps, down to the present day. This was physical geography, explained and illustrated by the aid of history. The earlier record of the same region when the mouth of the Rhine was somewhere in the latitude of the Orkneys, and the river-drift men tenanted what was then a part of a continent, but was now the island of Britain, as distinctly belonged to geology. The interesting facts connected with it were not ascertained by human testimony, but by other methods and for other objects. Here again we found a natural boundary-line between geology and geography, by means of which the whole body of facts relating to a locality could be logically divided between the two sciences, and conveniently classified. It was thus that physical geography found most efficient assistance from human testimony, for the study of the former condition of parts of the earth's surface at different epochs. It need not always be written testimony. The splendid temples of Selinunte on the south coast of Sicily, and the direction in which they had been thrown down, were the silent witnesses to a great earthquake in the eighth century. We had seen, too, how the statue of the goddess Nehelennia explained the direction and rate of movement of the sand-dunes of Zeeland. It was this testimony respecting the condition of the earth's surface at long intervals of time, which gave such importance to the editing and the study of old voyages and travels. Hence, every physical geographer ought to be a member of the Hakluyt Society. By careful reading, and by knowing what he wanted, he would pick many a plum out of the heaviest pudding. But, in truth, the quaint old narrators of voyages and travels were very rarely dull. The student of physical geography was sure to be rewarded by their perusal. He might be giving his attention to the formation of coral islands, and perhaps meditating on the question whether Bermuda once formed a great circle enclosing a lagoon. The existing evidence was the small west rock on the western reef gradually being reduced in size by the action of the waves. Further evidence of the dimensions of this rock in former times would be important. A man named Henry May went out as a mate with Lancaster in his first voyage to the East Indies, three centuries ago. May lost his ship somewhere near Puerto Rico on his return voyage, and took a passage home in a French vessel. He was shipwrecked on the western reef of Bermuda, and his journal supplied evidence respecting that west rock. He described that land as consisting in his time of "high cliffs." Further research might reveal its dimensions at some other period, and so help the researches of geographers; for the narrative of Bermudez, the discoverer of this coral group, was still buried in Spanish archives. When the explorer made new discoveries, their true significance could only be established by the testimony of history. The region round Lake Zuwaya to the south of Abyssinia was almost unknown, and was consequently very interesting to geographers. It was unvisited for centuries, and Mr. Ravenstein, our greatest authority on Africa, had to go back to the enterprises of the Portuguese to find any traces of it. Thus it was that we appreciated the value of the narrative of Father Alvarez, who accompanied the embassy of Rodrigo da Lima to Prester John; for one of the members of this embassy, in a journey to the southward of Abyssinia, described the lake, which had again been revealed to us by modern travellers after an interval of three centuries. Earthquakes composed another series of phenomena which belong to geology or geography, as they occurred before or after the dawn of human testimony. Seismology was a department of geography, and the record of earthquake phenomena could only be completed by researches into the history of the past. The colonial records, in the Spanish archives, thus enabled us to form a descriptive list of the earthquake phenomena on the western coast of South America, for the last three centuries; and similar chronological series could be gathered from historical documents, as regarded several other parts of the world. In all these departments the line between geology and geography could be defined without strain or danger of confusion; and the result of the consideration of the question of limits, from this point of view, seemed to be that it could be settled naturally and without undue concession on either side. The two sciences depended upon each other and were very closely allied. The geologist found the same phenomena in the rock formations of the past as the physical geographer discovered on the surface of the earth of the present. Both, for example, had the duty laid upon them of seeking out the agencies which rule in the processes of upheaval and depression. The fold, with its crest and trough, was common to both sciences; and geographers had rejoiced at the announcement of "a wedding-ring of geology and geography uniting them at once and forever in indissoluble union."

Mr. W. Topley, F.R.S., of the Geological Survey of England and Wales, approached the question from the geological standpoint. He admitted that physical geography is to a large extent the foundation of geology, inasmuch as a geologist must study processes now in action before he can understand the manner in which rocks, now forming the earth's surface, have been formed. On the other hand, the existing surface features of the earth can only properly be understood when viewed in relation to their geological structure. From this point of view geology is the foundation of physical geography. The range, shape, and character of these surface features are determined by the nature of the rocks and by the manner in which these rocks are arranged. Familiar illustrations of this point are afforded by the escarpments and valleys of England and France. It is equally apparent in the more complicated structure of mountains. The rocks of mountain ranges and their flanking hills are often contorted and inverted, so that the apparent succession is not the real one; but even here the surface features are equally controlled by the manner in which the rocks now lie. The existing surface of the land is almost entirely due to denudation; the manner in which this acts and the results developed vary with the nature and "lie" of the rocks. The soils of a district have mostly been produced by the weathering of rocks, etc., at the surface. The soil and the facility for obtaining water have determined the original settlement of any area. The land divisions consequent on such early settlement have been equally determined, in many parts, by geological structure.

The discussion was opened by Mr. Ravenstein, who combated the notion that physical geography was a new department of geology. Physical geography and geology stood to each other in a similar relation to that which existed between history and political geography. The physical geographer should concern himself with the composition and physical character of the rock and leave its history and development and age to the geologist.

Prof. Lapworth, of Birmingham, thought the two sciences shaded imperceptibly into each other. The stratigraphical geologist was indebted at every turn to his friend the physical geographer, and it was impossible clearly to define where the work of the one began and that of the other ended.

Prof. Valentine Ball, of Dublin, spoke in strong terms of condemnation of bad maps, and said that geographical students ought to study geology, which was the anatomy of the earth.

Dr. R. D. Roberts defined geology as the veracious history of the earth, which, if it could be told in detail, would explain the evolution of the earth from the physical geography of the past to that of the present.

Mr. Yale Oldham, University lecturer in geography at Cambridge, preferred to recognize physical geography as one of the branches of the great science of geography, which had also its historical, economic, and other aspects. The same sub-division of science which was so discernible in what was now called biology was at work in the two sciences of geology and geography.

The Rev. Prof. Bonney said that to try to make out the limits of geology and geography was very like trying to define the boundaries of a river which flowed into the sea and the sea itself. The real distinction was sufficiently indicated in the words themselves; one was earth description, and partook of the nature of an art. Geology, on the other hand—"Earth reason"—was rather a science than an art.

Col. Godwin-Austen was at a loss to understand how Mr. Markham's historical canon of the distinction between geography and geology could apply to two such countries as Australia and Egypt, the length of whose historical records was so widely different.

Sir A. Geikie spoke as having one foot in each of the two sciences. It was desirable that some line of cleavage should be drawn, though he hardly thought Mr. Markham's suggestion would find general acceptance. Geography might be regarded as the history of the earth; but the objection to Mr. Markham's theory was that discoveries might from time to time remove a series of phenomena from geology to geography.

Mr. W. M. Conway recounted his experiences in the Karakoram Mountains. Kashmir, he said, was very different from the idyllic land described by poets. It might be called a crumpled Sahara, with rocks and precipitous slopes, naked and without moisture or shade, and, in short, an *impossible* wilderness ; which appears to be something that defies geology and geography, as well as language. A letter just received from a British officer stationed at Gilgit gave an account of a flood which began on July 7th and in five days wrought a geological revolution. The peaks of the Karakoram Mountains range from 20,000 to 28,000 feet in height. They are very unlike the Alps, and are mostly in the form of towers of remarkable sharpness.

The still unsettled question of the theory of coral formations was discussed by the Geological and Biological Sections.

Professor W. Sollas opened the discussion by giving an historical account of the various hypotheses which had been advanced to account for the phenomena connected with coral reefs and atolls. He concluded by contending that Darwin's theory that the reefs were a later stage of barrier reefs erected on subsiding land was the true one. This theory was one of great simplicity and beauty, and one which accounted for all the facts which geology presented. The opposition which Agassiz offered to the theory was founded mainly on his study of the coral reefs of the Florida coast; but these reefs had been studied by Darwin, who came to the same conclusion as Agassiz as to those particular reefs. The great weakness of Darwin's case at the time of its enunciation was the absence of fossil reefs comparable with atolls, and this was pointed out by Charles M'Laren many years ago. Darwin, however, believed that such reefs would ultimately be found, and his expectation had been abundantly verified. In England there were only small remains of the kind, but in the Tyrol the Langkofen had a thickness of limestone to be identified with coral of over 3,000 feet.

Dr. Hickson quite agreed with Professor Sollas in thinking that Darwin's hypothesis was both simple and beautiful, but that was about the only point on which they agreed. Some few atolls, or groups of atolls, such as, for instance, the Fiji Archipelago, might possibly have been formed during subsidence, but the vast majority of atolls and barrier reefs could not be formed in that manner. The evidence was quite conclusive that many atolls occurred in regions where elevation had recently taken place, and was probably occurring now. Several points mentioned in Professor Sollas's address were not in accordance with recent observation. He hoped that, as a result of this discussion, some further investigations would be made on the rapidity and direction of the growth of coral reefs at the present day.

Dr. A. Rothpletz (of Munich), having a personal acquaintance with the region of the "dolomites," said some of the sections shown were not correct. In one case what was shown as overcast strata lying upon the dolomite was in reality below it. Moreover, great masses of rock within the area of the "dolomites," and which were usually called "Schlerndolomit," were not dolomite but limestone. The fossils contained in those were at present being worked out, and they included a large number of ammonites, bivalves, algæ, etc. Corals were not wanting even in the dolomite.

Mr. Gilbert Bourne said that it had been stated that reef-building corals flourished best where the breakers were heaviest on the edge of the reef. His own experience was that at these points only a few true corals grow and that the gardens of corals described by Professor Sollas were only to be found in quieter spots, where the corals were sheltered from the force of the breakers but bathed by a gentle and uniform current. Photographs of luxuriant coral beds bore out this assertion. Nor did he agree with the statement that the rock of which atolls were composed was formed by masses of corals flung over the edge of the reef by the waves. Dr. Guppy had shown that the large masses torn off at the edge of the reef tended rather to roll down the seaward face of the reef and to form a talus slope. It had been said that soundings of lagoons showed a filling up and shallowing of the lagoon. On what evidence did this assertion rest? Probably no atoll had been so thoroughly surveyed as the one with which the speaker was personally acquainted—the atoll of Diego Garcia. It was surveyed by the French at the end of the last century, by Captain Moresby in 1837, and nearly 50 years later by her Majesty's ship Rambler—in 1885. He had very carefully compared the soundings made by Captain Moresby with those made by the Rambler, and found that in nearly every case the soundings were almost identical, with the exception of a few channels in which, on the whole, the Rambler soundings showed greater depths. It must be remembered that the old soundings made with a hemp line were not always trustworthy and that they commonly gave rather greater depths than the soundings made with wire.

After referring to Semper's observations in the Pelew Islands, in which atolls, barrier-reefs, fringing-reefs, and recent elevated coral reefs were found in the same area, he said the information just given by Professor Rothpletz fully bore out the assertions made by Murray and Agassiz, that the upward growth of submarine banks was largely due not to coral growth, but to the accumulation of the calcareous skeletons of molluscs and echinoderms on those banks, while Professor Sollas had revived the old theories of a Lemuria and an Atlantis—theories which most people held to be long ago exploded—and had dwelt on the existence of coral islands in the Indian Ocean as evidence of a previously existing continent stretching from Africa and Madagascar to Ceylon and India. He had given no explanation of the fact that the tropical regions of the Atlantic Ocean, across which the old Atlantis was supposed to have stretched, are almost entirely destitute of coral formations.

Professor Bonney replied to Dr. Hickson's criticism on the relation of a reef to the island within, that a general correspondence was all that could be expected. He thought that at present the Tyrol dolomites must be carried to a suspense account, though certainly corals were a constituent. But he asked was there any evidence that a growing reef was found deeper than about 25 fathoms, for that was a point of first importance.

Sir H. Howorth, M.P., limited himself to the question of whether coral reefs are now growing in districts of upheaval or subsidence. The Pacific consists of two regions. One, the North Pacific, containing the Sandwich Archipelago, and the other consisting of the rest of the scattered islands of the Pacific, which are nearly all coral islands, while the former possesses a very peculiar fauna and flora containing a great many endemic species, pointing to its being a very old land surface which has subsided and been broken up into an archipelago. The other islands east of the Solomon Islands are occupied by accidental plants and animals, waifs and strays, which point to their having very recently risen from the sea, and therefore being *à priori* situated in an area of elevation. This is confirmed where we have positive evidence of the actual change of level going on at this moment where the corals are growing. We have such evidence in the case of the Philippines, Java, the Australian reef, the Fiji Islands, etc. We have sea beaches and other evidences of quite recent, if not current, elevation. A third class of evidence is the occurrence of solid and consolidated strata of coralline origin in such places as Florida, the Bahamas, Guadeloupe, and in many localities in the Pacific where coral reefs are still growing, which can only be explained by the areas in which they occur being areas of upheaval.

Rev. T. R. R. Stebbing observed that, as Darwin himself admitted, coral reefs might be begun in either one area or the other, but that the favorable situation was found to be in areas of subsidence. In answer to the inference drawn from the consensus of recent observers who were opposed to Darwin's theory, Mr. Stebbing called attention to the fine work on "The Great Barrier Reef of Australia," by Mr. Saville-Kent, that author entirely endorsing Darwin's view, as a result of his long-continued explorations in Queensland.

Mr. H. O. Forbes made some remarks on his observations in the Keeling Islands in the Indian Ocean. He pointed out that he had observed undoubted evidence of elevation both between two of the islets of the lagoon and in the construction of Horsburgh Island, the largest member of the group.

Professor Sollas, in reply, said his enlightenment had been of a different nature to that which he had anticipated, for the objections of most of the speakers were so easily met that his last lingering doubts as to the efficacy of Darwin's hypothesis had been wholly dispelled. He had been asked by Dr. Hickson for an instance of a reef with a steep seaward slope, and in reply he instanced the soundings recently made by Admiral Chambeyron on the reef of New Caledonia, when 600 metres from the edge the slope was found to vary from 51° to nearly 90°.

That the limestones of the Tyrol were not wholly dolomitic was well known, but they were usually structureless, and the rapid disappearance of structure from the coral growths of existing reefs is a familiar fact. That overcast bedding should occur below reef limestone was compatible with the mode of reef growths, but Dr. Rothpletz admitted that, if the limestones of the Tyrol were not coral reefs, those of the Eastern Alps are, and as these are sometimes 400 fathoms in thickness they fully supported Darwin's case. As regards Mr. Bourne's observations on the filling up of lagoons, Professor Sollas cited the instance of Elizabeth Reef, in the Coral Sea, where, in 1820, Captain King found a deep lagoon. It did not need wire sounding-lines to ascertain this, and in 1877 the greater part of this lagoon was found to be filled up to about one-and-a-half fathom. Lemuria and Atlantis he did not revive. The tract of land which Neumayer had mapped as existing across the Indian Ocean in Jurassic times was not Lemuria, and its existence was supported by the observations of most of the geologists on the Indian Survey, including its director, Mr. Oldham. In the Pelew Islands there did exist raised reefs, but these were on the margins of a recently sunken area. None of the opponents of Darwin's view had raised any objections which, when examined in detail, did not rather sustain than damage it.